ESSENTIAL FISH HABITAT ASSESSMENT REPORT

for the Scallop Fisheries

Off the Coast of Alaska

Prepared by

National Marine Fisheries Service
Alaska Department of Fish & Game
North Pacific Fishery Management Council

Compiled by

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for the Scallop Fisheries off the Coast of Alaska

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by
The Technical Team for Essential Fish Habitat
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INTRODUCTION

In 1996, the Sustainable Fisheries Act amended the Magnuson-Stevens Fishery Conservation and Management Act to require the description and identification of essential fish habitat (EFH) in fishery management plans (FMPs), adverse impacts on EFH, and actions to conserve and enhance EFH. Guidelines were recently developed by the National Marine Fisheries Service (NMFS) to assist Fishery Management Councils (Councils) in fulfilling the requirements set forth by the Act. In addition, the Act requires consultation between the Secretary and Federal and state agencies on activities that may adversely impact EFH for those species managed under the Act. It also requires the Federal action agency to respond to comments and recommendations made by the Secretary and Councils.

For scallops, essential fish habitat means those waters and substrate necessary to scallops for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of essential fish habitat: "waters" includes aquatic areas and their associated physical, chemical, and biological properties that are used by scallops, and may include areas historically used by scallops where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle.

After reviewing the best available scientific information, and in cooperation with the Councils, participants in the fishery, interstate commissions, Federal agencies, state agencies, and other interested parties, NMFS will develop written recommendations for the identification of EFH for each FMP. Prior to submitting a written EFH identification recommendation to a Council for an FMP, the draft recommendation will be made available for public review and at least one public meeting will be held. NMFS will work with the affected Council(s) to conduct this review in association with scheduled public Council meetings whenever possible. The review may be conducted at a meeting of the Council committee responsible for habitat issues or as a part of a full Council meeting. After receiving public comment, NMFS will revise its draft recommendations, as appropriate, and forward written recommendation and comments to the Council(s).

The following is a summary of the EFH regulations set forth in the guidelines:

Habitat Requirements by Life History Stage

All FMPs must describe EFH in text and with tables that provide information on the biological requirements for each life history stage of the species. These tables should summarize all available information on environmental and habitat variables that control or limit distribution, abundance, reproduction, growth, survival, and productivity of the managed species. Information in the tables should be supported with citations.

Description and Identification of EFH

An initial inventory of available environmental and fisheries data sources relevant to the managed species should be useful in describing and identifying EFH. This inventory should also help to identify major species-specific habitat data gaps. Deficits in data availability (i.e., accessibility and application of the data) and in data quality (including considerations of scale and resolution; relevance; and potential biases in collection and interpretation) should be identified.

To identify EFH, basic information is needed on current and historic stock size, the geographic range of the managed species, the habitat requirements by life history stage, and the distribution and characteristics of those habitats. Information is also required on the temporal and spatial distribution of each major life history stage (defined by developmental and functional shifts). Since EFH should be identified for each major life history stage, data should be collected on, but not limited to, the distribution, density, growth, mortality, and production of each stage within all habitats occupied, or formerly occupied, by the species. These data should be obtained from the best available information, including peer-reviewed literature, data reports and "gray" literature, data files of government resource agencies, and any other sources of quality information.

The following approach should be used to gather and organize the data necessary for identifying EFH. Information from all levels should be used to identify EFH. The goal of this procedure is to include as many levels of analysis as possible within the constraints of the available data. Councils should strive to obtain data sufficient to describe habitat at the highest level of detail (i.e., Level 4).

(1) Level 1: Presence/absence distribution data are available for some or all portions of the geographic range of the species. At this level, only presence/absence data are available to describe the distribution of a species (or life history stage) in relation to potential habitats. Care should be taken to ensure that all potential habitats have been sampled adequately. In the event that distribution data are available for only portions of the geographic area occupied by a particular life history stage of a species, EFH can be inferred on the basis of distributions among habitats where the species has been found and on information about its habitat requirements and behavior.

(2) Level 2: Habitat-related densities of the species are available. At this level, quantitative data (i.e., density or relative abundance) are available for the habitats occupied by a species or life history stage. Because the efficiency of sampling methods is often affected by habitat characteristics, strict quality assurance criteria should be used to ensure that density estimates are comparable among methods and habitats. Density data should reflect habitat utilization, and the degree that a habitat is utilized is assumed to be indicative of habitat value. When assessing habitat value on the basis of fish densities in this manner, temporal changes in habitat availability and utilization should be considered.

(3) Level 3: Growth, reproduction, or survival rates within habitats are available. At this level, data are available on habitat-related growth, reproduction, and/or survival by life history stage. The habitats contributing the most to productivity should be those that support the highest growth, reproduction, and survival of the species (or life history stage).

(4) Level 4: Production rates by habitat are available. At this level, data are available that directly relate the production rates of a species or life history stage to habitat type, quantity, quality, and location. Essential habitats are those necessary to maintain fish production consistent with a sustainable fishery and the managed species' contribution to a healthy ecosystem.

The information obtained through the analysis of this section will allow Councils to assess the relative value of habitats. Councils should interpret this information in a risk-averse fashion, to ensure adequate areas are protected as EFH of managed species. Level 1 information, if available, should be used to identify the geographic range of the species. Level 2 through 4 information, if available, should be used to identify the

habitats valued most highly within the geographic range of the species. If only Level 1 information is available, presence/absence data should be evaluated (e.g., using a frequency of occurrence or other appropriate analysis) to identify those habitat areas most commonly used by the species. Areas so identified should be considered essential for the species. However, habitats of intermediate and low value may also be essential, depending on the health of the fish population and the ecosystem. Councils must demonstrate that the best scientific information available was used in the identification of EFH, consistent with national standard 2, but other data may also be used for the identification. If a species is overfished, and habitat loss or degradation may be contributing to the species being identified as overfished, all habitats currently used by the species should be considered essential in addition to certain historic habitats that are necessary to support rebuilding the fishery and for which restoration is technologically and economically feasible. Once the fishery is no longer considered overfished, the EFH identification should be reviewed, and the FMP amended, if appropriate. EFH will always be greater than or equal to aquatic areas that have been identified as "critical habitat" for any managed species listed as threatened or endangered under the Endangered Species Act. Where a stock of a species is considered to be healthy, then EFH for the species should be a subset of all existing habitat for the species.

Ecological relationships among species and between the species and their habitat require, where possible, that an ecosystem approach be used in determining the EFH of a managed species or species assemblage. The extent of the EFH should be based on the judgment of the Secretary and the appropriate Council(s) regarding the quantity and quality of habitat that is necessary to maintain a sustainable fishery and the managed species' contribution to a healthy ecosystem. If degraded or inaccessible aquatic habitat has contributed to the reduced yields of a species or assemblage, and in the judgment of the Secretary and the appropriate Council(s), the degraded conditions can be reversed through such actions as improved fish passage techniques (for fish blockages), improved water quality or quantity measures (removal of contaminants or increasing flows), and similar measures that are technologically and economically feasible, then EFH should include those habitats that would be essential to the species to obtain increased yields.

The general distribution and geographic limits of EFH for each life history stage should be presented in FMPs in the form of maps. Ultimately, these data should be incorporated into a geographic information system (GIS) to facilitate analysis and presentation. These maps may be presented as fixed in time and space, but they should encompass all appropriate temporal and spatial variability in the distribution of EFH. If the geographic boundaries of EFH change seasonally, annually, or decadally, these changing distributions need to be represented in the maps. Different types of EFH should be identified on maps along with areas used by different life history stages of the species. The type of information used to identify EFH should be included in map legends, and more detailed and informative maps should be produced as more complete information about population responses (e.g., growth, survival, or reproductive rates) to habitat characteristics becomes available. Where the present distribution or stock size of a species or life history stage is different from the historical distribution or stock size, then maps of historical habitat boundaries should be included in the FMP, if known. The EFH maps are a means to visually present the EFH described in the FMP. If the maps identifying EFH and the information in the description of EFH differ, the description is ultimately determinative of the limits of EFH.

Prey species

Loss of prey is an adverse effect on EFH and a managed species, because one component of EFH is that it be necessary for feeding. Therefore, actions that reduce the availability of a major prey species, either through direct harm or capture, or through adverse impacts to the prey species' habitat that are known to cause a reduction in the population of the prey species may be considered adverse effects on a managed species and its EFH. FMPs should identify the major prey species for the species in the FMU and generally describe the location of prey species' habitat. Actions that cause a reduction of the prey species population,

including where there exists evidence that adverse effects to habitat of prey species is causing a decline in the availability of the prey species, should also be described and identified. Adverse effects on prey species and their habitats may result from fishing and non-fishing activities.

Identification of habitat areas of particular concern

FMPs should identify habitat areas of particular concern within EFH. In determining whether a type, or area of EFH is a habitat area of particular concern, one or more of the following criteria must be met:

(i) The importance of the ecological function provided by the habitat.
(ii) The extent to which the habitat is sensitive to human-induced environmental degradation.
(iii) Whether, and to what extent, development activities are, or will be, stressing the habitat type.
(iv) The rarity of the habitat type.

SUMMARY OF SCALLOP TECHNICAL TEAM RECOMMENDATIONS

Members of the Alaska Scallop EFH Technical Team who compiled this report were Lowell Fritz (NMFS), David Witherell (NPFMC), and Gordon Kruse (ADF&G). A summary of the technical team comments are provided below.

As a first step in description and identification of EFH, summaries of available information on the habitat requirements and distributions of each life stage of scallop species was based on previous literature summaries. In reviewing this information, the technical team noted differences between both the type and level of information available for Alaskan scallops compared with the expectations reflected in the national guidelines for description and identification of EFH. With respect to type, the information available for weathervane scallops and other scallop species is primarily broad geographic distributions based on specific samples from surveys and fisheries which have not been linked with habitat characteristics. Furthermore, our ability to precisely define the habitat (and its location) of each life stage in terms of its oceanographic (temperature, salinity, nutrient, current), trophic (presence of food, absence of predators), and physical (depth, substrate, latitude, and longitude) characteristics is very limited. Consequently, the information included in the habitat descriptions and life stage is restricted primarily to broad biogeographic and bathymetric areas (e.g., 50-100 m zone, south of Kodiak Island), and occasional references to known bottom types associations.

Specification of EFH Information Levels

With respect to the level of information available to describe species' habitats, the technical team adopted the definitions used by the groundfish technical teams. That is, they defined level 0 as a subset of the level 1 defined in the proposed rule. Level 0 was necessary to distinguish situations where no systematic sampling had been conducted for a species and life stage, but which may have been caught opportunistically during a survey using appropriate gear.

Classification of EFH levels used in this document based on available information. Note that this classification system differs slightly from the NMFS guidelines.

Level 0	No systematic sampling has been conducted for this species and life stage; may have been caught opportunistically in small numbers during other surveys.
Level 1	Presence/absence distribution data are available for some or all portions of the geographic range.
Level 2	Habitat-related densities are available. Density data should reflect habitat utilization, and the degree that a habitat is utilized is assumed to be indicative of habitat value.
Level 3	Habitat-related growth, reproduction, or survival rates are available. The habitats contributing the most to productivity should be those that support the highest growth, reproduction, and survival of the species (or life history stage).
Level 4	Habitat-related production rates are available. Essential habitats are those necessary to maintain fish production consistent with a sustainable fishery and a healthy ecosystem.

The technical team discussed how information levels could be applied to defining EFH, and agreed with the groundfish technical team recommendations. In cases where only level 0 information is available the technical team recommends that EFH be defined as everywhere the species' life stage has been observed, plus all of those areas of similar habitat based on literature-reported ranges and the opinions of scientists and persons with local knowledge. This EFH recommendation also applies to species/stages with level 1 information. In cases where level 2 information is available, the team recognized that areas of known concentration could be identified within a reported general distribution. Although areas of high concentration will be noted, EFH would still be designated as the general distribution, as with levels 0 and 1, as sufficient information could not be found (does not exist) "to determine the necessary habitat to support the target production goal." This was

concluded because of the arbitrary nature of the cutoff between high and low concentrations of the species, the resolution mismatch between habitat descriptions and species' distributions discussed above, and the team's inability to distinguish between areas occupied by a species and those habitats "necessary for spawning, breeding, feeding or growth to maturity" for an appropriate and useful EFH designation. This EFH designation follows that allowed under the NMFS guidelines.

The primary distinction between level 1 and 2 data is based on how well the available surveys sample a certain species life history stage. In this report, level 1 will refer to the situation where systematic sampling is adequate to reasonably establish presence or absence and encompasses a significant portion of potential habitat. Where sampling is inadequate to establish absence, and presence is established opportunistically or by studies in only a limited portion of the probable range, a level 0 is designated. For the most part, the only source of information that results in an information level of 1 or 2 are the ADF&G surveys for stock assessment of adults. A summary of the technical team's information classification for scallop species is shown in the table above. Closer examination of trawl survey data during the next phase of EFH identification may allow attainment of a higher level for certain species.

Levels of essential fish habitat information currently available for Alaska scallops, by life history stage. Juveniles were subdivided into early and late juvenile stages based on survey and fishery selectivity curves.

Species	Eggs	Larvae	Early Juveniles	Late Juveniles	Adults
Weathervane scallops	0a	0a	0a	1	2
Pink scallops	0a	0c	0a	0a	0a
Spiny scallops	0a	0c	0a	0a	0a
Rock scallops	0a	0c	0a	0a	0a

Note: for the larval stages of Pink, Spiny, and Rock scallops information is insufficient to infer general distributions.
0a: Some information on a species' life stage upon which to infer general distribution.
0c: No information on the actual species' life stage and no information on a similar species or adjacent life stages, or where complexity of a species stock structure prohibited inference of general distribution.

The technical team agreed that information about the entire range of a species should be included in the text descriptions, but the maps should only show the EFH distributions and known areas of high weathervane scallop concentrations within United States (3-200 nautical miles) and State of Alaska (0-3 miles) waters.

Identification of EFH for weathervane scallops included historical range information. Traditional knowledge and sampling data have indicated that distributions may contract and expand due to a variety of factors including, but not limited to, temperature changes, current patterns, changes in population size, and changes in predator and prey distribution.

The technical team agreed with the groundfish technical team's suggestions for future GIS mapping of scallop, crab, and fish distributions. Maps should include the date prepared, the information or data sets used, and location of sampling stations. It should be kept in mind that the distributions shown here are a first-cut and that distributions should be verified and updated as better or more current data become available. Larval and egg distributions will require research surveys specifically designed to collect this information.

The scallop technical team also agreed with the groundfish technical team regarding research needs to describe and identify EFH based on their review of available information. Initial research should focus on identification, quantification and mapping of habitats on the shelf and slope. The team notes requests for bathymetric mapping of the sea bottom to improve stock assessment capability in the Alaska EEZ have been a low priority for NOS. The team recommends increased support of the modest AFSC effort to develop bottom typing capability. The team notes the extent of level 0 and 1 tiers in the EFH level table. To increase EFH tier levels and obtain valid measures of habitat utilization, systematic surveys must be conducted throughout the full-depth habitat range of each species.

Abbreviations used in the EFH report tables to specify location, depth, bottom type, and other oceanographic features.

Location
BCH = beach (intertidal)
ICS = inner continental shelf (1-50 m)
MCS = middle continental shelf (50-100 m)
OCS = outer continental shelf (100-200 m)
USP = upper slope (200-1000 m)
LSP = lower slope (1000-3000 m)
BSN = basin (>3000 m)
BAY = nearshore bays, give depth if appropriate (e.g., fjords)
IP = island passes (areas of high current), give depth if appropriate

Water column
D = demersal (found on bottom)
SD/SP =semi-demersal or semi-pelagic if slightly greater or less than 50% on or off bottom
P = pelagic (found off bottom, not necessarily associated with a particular bottom type)
N = neustonic (found near surface)

Bottom Type
M = mud S = sand R = rock
SM = sandy mud CB = cobble C = coral
MS = muddy sand G = gravel K = kelp
SAV = subaquatic vegetation (e.g., eelgrass, not kelp)

Oceanographic Features
UP = upwelling G = gyres F = fronts
CL = thermo- or pycnocline E = edges

General
U = Unknown NA = not applicable

Habitat Description for Weathervane Scallops (*Patinopectin caurinus*)

Management Plan and Area Eastern Bering Sea-Aleutian Islands (BSAI) and Gulf of Alaska (GOA)

Scallops are managed under the Fishery Management Plan for the Scallop Fishery off Alaska. Scallops occur throughout the area covered by the FMP and extend south to California.

Life History and General Distribution

Weathervane scallops are distributed from Point Reyes, California, to the Pribilof Islands, Alaska. The highest known densities in Alaska have been found to occur in the Bering Sea, off Kodiak Island, and along the eastern gulf coast from Cape Spencer to Cape St. Elias. Weathervane scallops are found from intertidal waters to depths of 300 m, but abundance tends to be greatest between depths of 40-130 m on beds of mud, clay, sand, and gravel. Beds tend to be elongated along the direction of current flow. A combination of large-scale (overall spawning population size and oceanographic conditions) and small-scale (site suitability for settlement) processes influence recruitment of scallops to these beds. Sexes are separate and mature male and female scallops are distinguishable based on gonad color. Although spawning time varies with latitude and depth, weathervane scallops in Alaska spawn in May to July depending on location. Eggs and spermatozoa are released into the water, where the eggs become fertilized. After a few days, eggs hatch, and larvae rise into the water column and drift with ocean currents. Larvae are pelagic and drift for about one month until metamorphosis to the juvenile stage when they settle to the bottom.

Several other species of scallops found in the EEZ off Alaska have commercial potential. These scallops grow to smaller sizes than weathervanes, and thus have not been extensively exploited in Alaska. Pink scallops, *Chlamys rubida*, range from California to the Pribilof Islands. Pink scallops are found in deep waters (to 200 m) in areas with soft bottom, whereas spiny scallop occur in shallower (to 150 m) areas characterized by hard bottom and strong currents. Pink scallops mature at age 2, and spawn in the winter (January-March). Maximum age for this species is 6 years. Spiny scallops, *Chlamys hastata*, are found in coastal regions from California to the Gulf of Alaska. Spiny scallops grow to slightly larger sizes (75 mm) than pink scallops (60 mm). Spiny scallops also mature at age 2 (35 mm) and spawn in the autumn (August-October). Rock scallops, *Crassadoma gigantea*, range from Mexico to Unalaska Island. Rock scallops are found in relatively shallower water (0-80 m) with strong currents. Apparently, distribution of these animals is discontinuous, and the abundance in most areas is low. These scallops attach themselves to rocks, attain a large size (to 250 mm), and exhibit fast growth rates. Rock scallops are thought to spawn during two distinct periods, one in the autumn (October -January), and one in the spring-summer (March-August).

Fishery

The weathervane scallop resource consists of multiple, discrete, self sustaining populations that are managed as separate stock units. Scallop stocks in Alaska have been managed under a federal fishery management plan (FMP) since 1995. The FMP controls the fishery through permits, registration areas and districts, seasons, closed waters, gear restrictions, efficiency limits, crab bycatch limits, scallop catch limits, inseason adjustments, and observer monitoring. Most of these regulations were developed by the State prior to 1995. Dredge size is limited to a maximum width of 15 feet, and only 2 dredges may be used at any one time. In the Kamishak District of Cook Inlet, only 1 dredge with a 6' maximum width is allowed. Dredges are required to have rings with a 4" minimum inside diameter. To reduce incentives to harvest small scallops,

crew size on scallop vessels is limited to 12 persons and all scallops must be manually shucked. Dredging is prohibited in areas designated as crab habitat protection areas, similar to the groundfish FMPs.

Since 1967, when the first landings were made, fishing effort and total scallop harvest (weight of shucked meats) have varied annually. Total commercial harvest of weathervane scallops has fluctuated from a high of 157 landings totaling 1,850,187 pounds of shucked meats by 19 vessels in 1969 to no landings in 1978. Prices and demand for scallops have remained high since fishery inception. Prior to 1990, about two-thirds of the scallop harvest has been taken off Kodiak Island and about one-third has come from the Yakutat area; other areas had made minor contributions to overall landings. Harvests in 1990 and 1991 were the highest on record since the early 1970s. The 1992 scallop harvest was even higher at 1,810,788 pounds. The increased harvests in the 1990s occurred with new exploitation in the Bering Sea.

Relevant Trophic Information

Scallop predators have not been well studied. Scallops are likely prey to various fish and invertebrates during the early part of their life cycle. Flounders are known to prey on juvenile weathervane scallops, and seastars may also be important predators.

Upper size limit of juveniles

Weathervane scallops begin to mature by age 3 at about 7.6 cm (3 inches) in shell height (SH), and virtually all scallops are mature by age 4. Growth, maximum size, and size at maturity vary significantly within and between beds and geographic areas. Weathervane scallops are long-lived; individuals may live 28 years old or more. The natural mortality rate is thought to be about 15% annually (M = 0.16).

Sources for additional distribution data

Distributional information is contained in the Literature cited section.

Habitat and Biological Associations

Scallops are found from intertidal waters and to 300 m. Abundance tends to be greatest between 45-130 m on beds of mud, clay, sand and gravel (Hennick 1973). Weathervane scallops are associated with other benthic species, such as red king crabs, Tanner crabs, shrimps, octopi, flatfishes, Pacific cod, and other species of benthic invertebrates and fishes.

Literature

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SPECIES: Weathervane Scallops off Alaska

Stage - EFH Level	Duration or Age	Diet/Prey	Season/Time	Location	Water Column	Bottom Type	Oceano-graphic Features	Other
Eggs	several days	None	May-July	MCS, ICS	D		N/A	
Larvae	2-3 weeks		May-August	ICS, MCS, OCS	P		N/A	
Juveniles	Age 0 to Age 3		Aug. +	MCS	D	CL, M, S, G	N/A	
Adults	Age 3 - 28		Spawning May-July	MCS	D	CL, M, S, G	UNK	

See table of contents for the following map:

Weathervane scallops

RESEARCH NEEDS

Each FMP should contain recommendations, preferably in priority order, for research efforts that the Councils and NMFS view as necessary for carrying out their EFH management mandate. The need for additional research is to make available sufficient information to support a higher level of description and identification of EFH. Additional research may also be necessary to identify and evaluate actual and potential adverse effects on EFH, including, but not limited to, direct physical alteration; impaired habitat quality/functions; cumulative impacts from fishing; or indirect adverse effects such as sea level rise, global warming and climate shifts; and non-equipment related fishery impacts. The Magnuson-Stevens Act specifically identifies the effects of fishing as a concern. The need for additional research on the effects of fishing equipment on EFH and a schedule for obtaining that information should be included in this section of the FMP. If an adverse effect on EFH is identified and determined to be an impediment to maintaining a sustainable fishery and the managed species' contribution to a healthy ecosystem, then the research needed to quantify and mitigate that effect should be identified in this section.

Currently, there is very limited information on the distribution of all life stages of scallops in Alaska pink, spiny, and rock . Except for adults, information on the distribution of weathervane scallops is also limited. Research should be directed at collecting this information.